

(6.12) Using the Gamow theory the probability for tunneling of an  $\alpha$ -particle in the decay of  $^{238}\text{U}$  is  $1:10^{38}$ , and the  $\alpha$ -particle hits the walls about  $10^{21}$  times per second. What average lifetime can be predicted for  $^{238}\text{U}$  from this information?

$$f := 10^{21} \cdot \frac{1}{\text{sec}} \quad f = 1 \cdot 10^{21} \cdot \text{sec}^{-1} \quad \text{Frequency of wall collisions.}$$

$$p := 10^{-38} \quad \text{Penetration probability when hitting the wall.}$$

$$\lambda := f \cdot p \quad \text{Probability of escape per unit time, i.e. } \alpha\text{-decay}$$

$$\tau := \frac{1}{\lambda} \quad \text{eqn(4.42)} \quad \tau = 1 \cdot 10^{17} \cdot \text{sec} \quad \text{or} \quad \tau = 3.169 \cdot 10^9 \cdot \text{yr}$$